

**METHODS AND APPARATUS FOR OPERATING AND PERFORMING
DIAGNOSTICS IN A CONTROL LOOP OF A CONTROL VALVE**

Abstract

A control loop of a control valve is operated using outlet pressure from a pneumatic amplifier as the control parameter. The control loop may be operated continuously in pressure control mode, or may be switched from another mode, such as travel control mode, to pressure control mode in response to certain operating conditions such as operation in the cutoff range, operation with the throttling element engaging a travel stop, or as a backup in the event of primary control parameter sensor failure. Operating the control loop in pressure control mode further allows diagnostics to be performed on the control loop components, even when the system is operating in cutoff range or has engaged a travel stop. The diagnostics may be performed using pressure and displacement sensors normally provided with a positioner. A processor may be programmed to receive data from the sensors and generate fault signals according to a logic sub-routine. The logic sub-routine may include calculating mass flow of control fluid through pneumatic amplifier outlet ports and comparing other operating parameters to detect leaks and blockages in the control loop components. Once a fault is detected, the location of the root cause of the fault may be identified by characterizing operating parameters of the control loop at the time of the fault.